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CLAIMS:

1. A process of producing aluminium and aluminium-containing materials from a solid aluminium-containing
5 feed material that comprises:

- 10 (a) leaching the aluminium-containing feed material with a leach liquor and forming an aqueous solution containing aluminium ions;
- 15 (b) extracting aluminium ions from the aqueous solution by contacting the aqueous solution with an organic reagent and loading aluminium ions onto the organic reagent and forming an aluminium complex; and
- 20 (c) recovering aluminium or an aluminium-containing material from the aluminium complex.

2. The process defined in claim 1 wherein the aluminium-containing material comprises any one or more of
25 alumina, aluminium hydroxide, aluminium trihydrate, and aluminium chloride in any suitable solid form.

3. The process defined in claim 1 or claim 2 wherein the recovery step (c) comprises displacing aluminium ions
30 from the aluminium complex by contacting the aluminium complex with an aqueous solution and thereafter recovering aluminium or an aluminium-containing material.

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4. The process defined in claim 3 wherein the solution used in step (c) is a more acidic solution than the initial leach liquor used in step (a) and has limited solubility for aluminium and step (c) comprises displacing
5 aluminium ions from the aluminium complex by precipitating the solid aluminium or aluminium-containing material from the solution.

5. The process defined in claim 4 wherein step (c)
10 comprises recovering the precipitated solid aluminium or aluminium-containing material from the solution.

6. The process defined in claim 3 wherein the solution used in step (c) is an acidic solution and step
15 (c) comprises displacing aluminium ions from the aluminium complex into solution.

7. The process defined in claim 6 wherein the acidic solution is a hydrochloric acid solution.

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8. The process defined in claim 7 wherein the hydrochloric acid solution has a pH of 1-6.

9. The process defined in any one of claim 6 to 8
25 wherein step (c) comprises recovering the solid aluminium or aluminium-containing material from the solution by heating the solution and causing thermal dissociation to drive off water and hydrochloric acid in gaseous forms and produce alumina in a solid form.

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10. The process defined in claim 6 wherein step (c) comprises recovering the solid aluminium or aluminium-

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containing material from the solution by transferring aluminium ions into an ionic liquid.

11. The process defined in claim 10 comprises
5 recovering aluminium from the ionic liquid.

12. The process defined in claim 11 comprises
recovering aluminium from the ionic liquid by applying a
potential across an anode and a cathode positioned so that
10 at least the cathode is in contact with the ionic liquid
and depositing aluminium on the cathode.

13. The process defined in any one of claims 10 to 12
comprises transferring aluminium ions into the ionic
15 liquid directly from the solution.

14. The process defined in claim 13 wherein the ionic
liquid is hydrophobic with a high affinity for aluminium
and is stable in the presence of water.
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15. The process defined in any one of claims 10 to 12
comprises transferring aluminium ions into the ionic
liquid indirectly from the solution.

25 16. The process defined in claim 15 comprises
transferring aluminium ions from the solution contained in
one compartment into the ionic liquid contained in another
compartment via a membrane, diaphragm or other suitable
means that is permeable to aluminium ions and separates
30 the compartments.

17. The process defined in claim 16 wherein the
driving force for the transfer of aluminium ions from the

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compartment containing the solution to the other compartment containing the ionic liquid is either by concentration gradient or by having an anode in the aqueous compartment and a cathode in the ionic liquid compartment.

18. The process defined in claim 3 wherein step (c) comprises displacing aluminium ions from the aluminium complex by precipitating solid material, dissolving precipitated solid material in an ionic liquid directly or indirectly, and recovering the solid aluminium or aluminium-containing material from the ionic liquid.

19. The process defined in claim 3 wherein step (c) comprises displacing the aluminium ions directly from the aluminium complex by transferring aluminium ions into an ionic liquid and recovering aluminium from the ionic liquid.

20. An aluminium or aluminium-containing material produced by the process defined in any one of the preceding claims.